

Distributed Diagnosis, Prognosis and Recovery for Complex Systems, Phase I

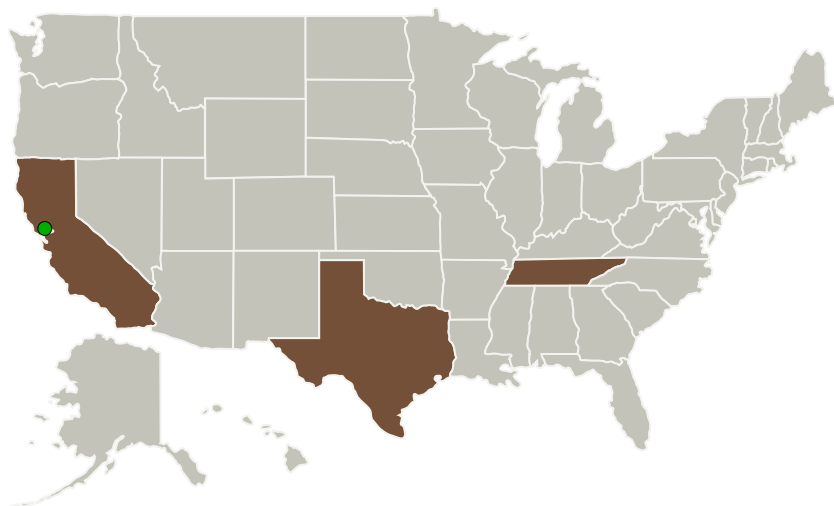
Completed Technology Project (2010 - 2011)



Project Introduction

Complex space systems such as lunar habitats generate huge amounts of data. For example, the International Space Station (ISS) has over 250,000 individually identified pieces of low-level telemetry and commands. Innovative algorithms for collecting and analyzing this data are leading to new technologies for managing large, complex and distributed systems. Lunar habitats will have multiple interacting subsystems that govern their behavior and performance. Assessing the health of the different subsystems and their effect on the overall system will be crucial to effective and safe control and operation of lunar habitats. There are three complementary approaches to diagnosis, prognosis, and recovery: 1) model-based approaches that rely on a priori models of the systems; 2) data-driven approaches that mine sensor and command data using machine learning and statistical methods; and 3) procedure-driven approaches that perform system tests and branch on the results until a root cause is found and a recovery strategy executed. We are proposing to build a comprehensive and integrated approach to fault diagnosis, prognosis and recovery that combines all three of these approaches emphasizing their strengths and negating their weaknesses. The resulting system will monitor spacecraft systems, detect and diagnose failures and respond to mitigate those failures.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
TRAC Labs, Inc.	Lead Organization	Industry	Webster, Texas
● Ames Research Center (ARC)	Supporting Organization	NASA Center	Moffett Field, California
Vanderbilt University	Supporting Organization	Academia	Nashville, Tennessee

Primary U.S. Work Locations

California	Tennessee
Texas	

Project Transitions

▶ **January 2010:** Project Start

✓ **January 2011:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138944>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

TRAC Labs, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

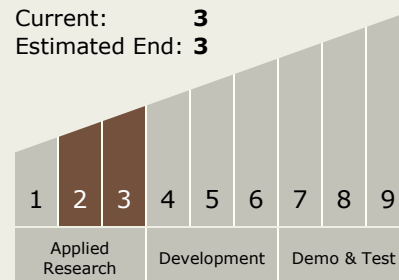
Carlos Torrez

Principal Investigator:

David M Kortenkamp

Technology Maturity (TRL)

Start: 2
Current: 3
Estimated End: 3



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Technology Areas

Primary:

- TX10 Autonomous Systems
 - └ TX10.2 Reasoning and Acting
 - └ TX10.2.5 Fault Diagnosis and Prognosis

Target Destinations

The Sun, Earth, The Moon,
Mars, Others Inside the Solar
System, Outside the Solar
System